THE NEWER
PAINT MATERIALS

AN ADDRESS DELIVERED BY

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BEFORE THE

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The Newer Paint Materials

The paint and varnish industry has advanced more within the last ten years than it had advanced in the previous three centuries. We have in 1274, in the second year of the reign of Edward I., an account relating to what is known as the Painted Chamber, where a painter named Raymond sent an invoice in which he itemized the materials that he had used, consisting of 16 gallons of oil, and 24 pounds of varnish, and some gold leaf. We have an additional account in 1289, where, in the seventeenth year of the reign of Edward I., the Painted Chamber was repaired, and white lead, varnish, green oil, red lead, red ochre, vermilion, indigo, etc., were used. There are a number of such historical items existing in England, all of which antedate the time of the Van Eycks, who were reputed to have discovered the method of artistic painting in oil, and I cannot find in any of my investigations that there has been very much improvement in the materials used from those days to the present age.

Of course, we have some 215 pigments, and only about 15 of them are perfectly permanent under all conditions, but for centuries we have had only one oil, and that is linseed oil, and for upwards of 2,000 years we have had only one white pigment, and that is white lead.

Sixty or seventy years ago, when zinc oxide was first invented, no one would use it, but today, bulk for bulk, there is as much zinc oxide used as white lead, and there are three or four other pigments which have found their places and are destined to remain.

There has been but one oil medium and one diluent from time immemorial, and these are linseed oil and turpentine. It is my province tonight to speak to you of other materials which are not substitutes for linseed oil and turpentine, but which, under certain circumstances, are far superior to these. It must be understood, however, that I am not here as an iconoclast, nor am I here to recommend materials which should sail under a false flag, and to those of you who are paint manufacturers I must say that if a customer wants a paint made of linseed oil and turpentine, it is not your province to substitute anything else, even though you may give him a far superior article.

Within the last year we have been brought face to face with a condition in the linseed oil and turpentine market that has been unprecedented, and from a price of, say, 5 cents per pound three years ago, linseed oil has advanced to the unprecedented price of nearly 14 cents per pound. This has been largely due to the shortage of the seed crop in the United States and the shortage throughout the rest of the world, and I think that this exceptional price, which will be maintained from the present outlook for at least a year, is not without good.

You will be surprised to know that there are many industries which in former years depended entirely upon linseed oil, do not depend upon it today, and I know of at least two oilcloth factories where waterproof fabrics are made that have abandoned the use of linseed oil, and now make better goods by using fish oils and China wood oil.

The floor oilcloth industry (and I speak only of the United States, for I have no knowledge of the manufacturing conditions in other countries) is today using from 25 to 75 per cent of oils other than linseed, and it is going to surprise the very manufacturers themselves, when they learn within a few years that their products will not only wear better, but retain their flexibility far longer than when made entirely of linseed oil.

The only trade outside of the paint industry that uses linseed oil in large quantities, and that has not advanced in proportion to other industries, is that of the printing and allied ink makers, who use the pitches and the rosin oils for cheaper inks, but who do not use anything but linseed oil varnish for their better inks because of insufficient knowledge.

The last to fall in line is the paint manufacturer, and it may not be amiss for me to tell you that, although the paint industry received a violent setback in the United States in 1906 owing to adverse legislation, in which several of the states attempted and succeeded in making laws practically dictating to the paint manufacturer how he should make his paint and compelling him to label each package, the result was beneficial for all parties concerned, because it exposed the ignorant and the wily, who substituted a soap water emulsion for linseed oil, and it strengthened the reputable manufacturer who made good paint according to his own experience.

A number of reputable manufacturers, however, in the United States have quietly and unostentatiously been using materials for the manufacture of paints which are far better than the paints made in the old way under certain circum-

stances, and the newer materials that are entering into the manufacture of paint are fish oil, corn oil, soya bean oil, China wood oil, degras, tungates, and resinate driers, the slowly evaporating petroleum oils free from paraffin, benzol, toluol, and the various derivatives of benzol, and a number of other combinations of these various oils in conjunction with proper driers, which, as I will show you, can be used where formerly other paint was useless.

Foremost among the paints for painting concrete and brick work, particularly for interior purposes, are the China wood oil paints, and the driers made with China wood oil. I shall speak of these driers later on, and for the sake of brevity and classification I have called these driers, etc., tungates, for one of the correct names for China wood oil is tung oil, and a fatty acid soap of tung oil made of manganese, lead or zinc has been by Dr. Lewkovitsch properly called the tungate of lead and tungate of zinc., etc., in contradistinction to the linoleates and oleates of these metals.

These tungates possess an advantage over other driers in so far that they dry in moist atmosphere, and their manufacture is confined entirely to those factories that have precipitation and washing plants.

Fish Oil.

The name fish oil means very little, other than that it may be an oil expressed from any fish; and not all fish oils are suitable for paint making. We have in the market five or six species of fish oil, such as menhaden, whale, sperm, cod, etc., and of these oils the only one that shall receive consideration in this treatise is menhaden oil, because for lack of space and time I cannot describe the other oils nor enter into their qualities.

Menhaden oil is derived from the menhaden fish, which is found on the North Atlantic coast of the United States, and is a totally different oil from that which we knew ten or fifteen years ago.

The older fish oils with which I originally experimented all had a specific gravity of 9.25 to 9.31, and today it is quite difficult to find a bleached or refined fish oil which has a specific gravity over 9.20. In former years, sailing vessels collected enormous quantities of fish, and when a cargo had been caught they sailed to port to the refineries, with the result that in the summer time decomposition took place and the resulting oil suffered accordingly. The present method, which any one can watch along the Atlantic coast,

is the collection of these fish by specially built steam vessels, and the fish are delivered to the refineries before they have a chance to decompose, with the result that much of the menhaden oil on the market has little or no odor, and I am sure that additional progress will be made, so that within a few years we will have practically odorless fish oil.

It has been stated that menhaden oil properly bleached or refined does not produce as hard a film as linseed oil, but this I am inclined to dispute. If raw linseed oil is mixed with a pigment, it makes a very poor, spongy, badly adherent film, but if a good drier is added and the proper kind of diluent, this is overcome. The same is true of fish oil, and if fish oil is treated with the proper tungate drier, that film produced has a number of advantages over linseed oil, for, as I have described in another publication,* fish oil is remarkably adapted for making smokestack paints, and linseed oil cannot compare with it for exposed hot surfaces. Furthermore, the addition of from 25 to 50 per cent of a properly refined and treated fish oil with a tungate drier, stands the sea air much better than linseed oil does, and from a long series of experiments made by me, it is quite obvious that the chalking of white lead and the hard-drying qualities of zinc oxide are both overcome to some extent by the moderate use of fish oil.

The table oilcloth and leather industries are already awake to the remarkable qualities of a pure menhaden oil properly treated, and the imitation rubber fabrics which are on the market are in many instances made entirely of fish oil, tung oil and pigments.

As for the smell of fish oil, this can be overcome provided the oil is not rancid.

China Wood Oil.

There is very little that can be added to my previous writings concerning China wood oil. In America we can make a better varnish out of China wood oil and rosin than out of Manila copal and linseed oil. The average paint and varnish manufacturer who is not up to date cannot, of course, manipulate China wood oil with success, for we have found in paint chemistry, as we have found in everything else, that a rule-of-thumb method is not only obsolete but unprofitable, for uniform goods cannot be produced unless they are manufactured by scientific control.

China wood oil is a remarkable material, and for enamel paints and for hard drying paints it will probably not be

*Chemistry and Technology of Paints. Tech, pp. 94,94.

superseded for many years. It produces a washable surface, but the best results are obtained where small quantities of linseed oil are added during the course of its preparation. For the manufacture of driers it is of great advantage. We have in America a tradition that a turpentine-Kauri-japan drier is the proper kind of a drier for all purposes. Of course, it is the ultimate consumer that pays for this fancy material, but the Kauri that is usually used for a drier of this kind costs only a few cents per pound and is called Kauri dust, and ranges all the way from 40 to 80 per cent of dirt. The Kauri dust that has only 40 per cent of dirt in it is supposed to be a very superior article, and I am positive in my statement that even if a man made a Kauri-japan drier out of the highest-priced gum and mixed it with a properly made paint, there is no man at the end of three years who could see the difference between a paint made of such a drier and a paint made of a tungate drier reduced with benzine.

Corn Oil.

This oil is known in England as maize oil, and when it was first used as a paint material it was looked upon with disfavor. This was primarily due to the fact that it was sold at a ridiculously low price, and was immediately regarded for that reason as an adulterant.

It happened that a few years ago refined corn oil was as dear as raw linseed oil, and then its true value was exploited. It was found that paint manufacturers who had learned how to use it could not do without it. Corn oil in its refined state does not lend itself well for the manufacture of mixed paints, but corn oil properly treated makes a very fair medium. Its use, however, is not for this purpose as much as it is for the purpose of grinding paste paints. We have all found that the reduced leads such as white paints containing lead, zinc and barytes, the heavy paste pigments like Venetian red, Indian red, chrome greens and blacks all have a tendency to become hard and are broken up with difficulty, and this is the case only when they are ground in pure raw linseed oil. It was observed that when the heavy metallic pigments were ground in linseed oil to which from 25 to 50 per cent of corn oil had been added, the resulting product remained soft for many years, and it is my judgment that no manufacturer who uses a percentage of corn oil should have any reticence in admitting it, in view of the fact that the resulting product is superior to that which contains no corn oil.

Soya Bean Oil.

Judging from the imports in the United States, soya bean oil has sprung into tremendous favor in a remarkably short space of time, and it has characteristics similar to China wood oil. It is excellent for grinding heavy paste paints, and it is of good use for the manufacture of interior flat wall finishes. As far as I know at present, it is impossible to use it in its raw state, but when properly heated with an oleate or tungate drier, it possesses a great deal of merit.

For the manufacture of enamels which are used for baking, or, as you call it in England, stoving, it has quite some merit, but its use for exposed places has not yet been thoroughly proved.

Degras.

This is a sheep's wool fat, which has been exploited to some extent for the manufacture of paints. In its raw state it is not to be recommended, but when properly prepared with the driers its use as a ship's bottom paint is said to have a great deal of merit. My experiments in this line have not been sufficient for me to draw any conclusions.

Cottonseed Oil.

This material has been used to some extent in the manufacture of putty, but as a paint oil it is not to be recommended. There is no doubt that if the exigency of the case demanded, the paint chemist could produce a good oil from cottonseed oil, but in view of the fact that we have oils other than linseed oil which are taking its place, I would not recommend the use of cottonseed oil as a paint vehicle at present. Cottonseed pitch and the other pitches are used to some extent for the manufacture of barn paints, for you must know that in the United States of America we have a tremendous amount of wooden structures, such as outhouses, barns and stables, belonging to farmers, for which custom has decreed "any old kind" of paint, but, inasmuch as these pitch oil residues are susceptible to light and crack upon exposure, they become susceptible to water, and have not given the same lasting results that the oil paints have attained.

Turpentine and Turpentine Substitutes.

I must again impress upon my hearers that no man has a moral right to sell one material for another, and if turpentine is demanded by a consumer, turpentine should be delivered, but I have an impression that the exceptionally

high price of turpentine and linseed oil are not due entirely to shortage of crop. There are many men in the United States and in England who have sufficient money to buy up the entire crop of flaxseed or of turpentine if they so see fit, and buying up products of this kind has been termed "cornering the market," a process which has upset all theories of political economy as to demand and supply. I question the right of any man to take more out of the common store than that which is his share, and if turpentine is worth 40 cents per gallon and we are forced to pay 82 cents for it for reasons such as I have described, and if we are forced to pay far more for linseed oil than the economic conditions demand, I feel that it is our right as scientists to exploit other materials, and if we can prove that the newer materials are answering the purpose of those whose use we have been deprived of except at exorbitant figures, we are benefiting mankind generally and teaching a well-learned lesson to those who, as I have stated, take more out of the common store than is their allotted share.

Turpentine is the well-known product of a pine tree, and it has absolutely no value whatever as a binding paint material. If you or I took 100 pounds of white lead and mixed it with 5 gallons of turpentine, and painted the exterior of a house with it, the first strong wind or rain storm would remove the paint; consequently we cannot use too much turpentine for diluting paints. If, according to our knowledge, we took a sample of turpentine and flowed it over a sheet of glass, in twenty minutes there must be practically no residue left on the glass. Now, if we took a petroleum product which will evaporate in twenty minutes, which contains no product that is harmful to the pigment or the oil, and which gives fluidity and unctuousness to the paint or varnish and which costs one-fourth of the price of turpentine, I say that we are pulling the wool over our own eyes to use turpentine, if we can demonstrate that the petroleum product is equal.

We have in the United States an industry called the window shade industry, and I believe from the construction of the windows in Europe as compared to ours, you do not use the same kind of a shade protector as we have, but there are millions of yards of thin cotton sheeting coated on both sides in the United States with a reduced oil paint, and this sheeting, when so treated, is called window shade cloth. I do not know of a single manufacturer of window shade cloth who uses turpentine as a diluent. If he did, his product would be no better than if he used a petroleum product, and he would rapidly be driven out of business

on account of the excessive cost of his material. Of the millions of yards of table oilcloth and floor oilcloth that are manufactured in the United States in which paint is used as a protective and decorative coat, not one ounce of turpentine is used as a diluent, but hundreds of thousands of gallons of petroleum products are used. The same is true of every industry that uses paint in large quantities, excepting the poor deluded house painter or ignorant consumer, and much of this lack of progress is due to the fact that engineers who otherwise have an exceptional training write paint specifications on a subject of which they are ignorant, and whenever I see a specification calling for turpentine-Kauri-japan it is an indication to me that some ultimate consumer is paying for a high-priced article. Some years ago I rewrote the paint specifications for a railroad where a large amount of paint was used for exterior work composed of steel structures. The specification which was used called for a mixture of white lead and zinc oxide in equal proportions reduced with raw linseed oil, to which a quantity of turpentine and turpentine-Kauri-japan was added. This was some seven or eight years ago. I amended the specification calling for a mixture of a percentage of whiting and silica in the paint and eliminating the so-called turpentine-Kauri-japan, and substituted for it a benzine oil drier which should contain a small quantity of wood turpentine. There was a difference between the new and the old paint, and this railroad corporation has never found it necessary to change its specification, for the new paint held its color better than the old paint did, and cost considerably less money.

I just want to say one word about wood turpentine, and I do not think that this material is so well known in Europe, but we have had mountains of pine sawdust and wood shavings in the United States which were useless until it was found that by distillation two excellent products were obtained. One was wood turpentine, which had identically the same qualities as sap turpentine, and the other was a heavy oil known as pine oil. Pine oil is used in industries other than the paint industry, but wood turpentine, although it has a strong, pungent odor, is a powerful solvent, and can be recommended for exterior paint purposes. For interior purposes it should not be used, owing to the fact that the pungent odor is disagreeable to the men who use it.